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**Research Article**

# A clinical study: prevalence and management of cholelithiasis

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## ABSTRACT

**Background:** Cholelithiasis is a chronic recurrent disease of the hepatobiliary system. The impaired metabolism of cholesterol, bile acids and bilirubin are characterized by gallstone formation. The prevalence of cholelithasis varies and has been reported as 2-29% in India, and increased in the recent years. In the present study, apart from studying the epidemiology i.e., demographic factors, dietary habits, clinical presentation, diagnostic tools and management, it also looks at the stone analysis, bile culture and complications after surgery in rural population in central India. To study the modes of presentation of gallstones, various treatment modalities, their outcome and complications and chemical analysis of gallstones in relation to the type of diet.
**Methods:** Department of Surgery at NPK Salve Institute of Medical Sciences, Nagpur, from September 2010 to October 2012 on 104 patients fulfilling the inclusion criteria selected for the study. Clinical symptoms were noted according to clinical history of the patients. The ultrasonography scanning of the abdomen performed, open/laparoscopic cholecystectomy was done.
**Results:** The mean age of the patients was 43.56 years with a male-female ratio of 0.52:1. Mixed type of diet, and multiple gallbladder calculi of mixed type was observed. Wound infection was the commonest complication in open cholecystectomy group, and the mean hospital stay was significantly more in this group.

**Keywords:** Cholelithiasis, Gallstones, Cholecystectomy, Laparoscopy

## INTRODUCTION

Gallstone disease remains one of the major causes of abdominal morbidity and mortality through the world.[1] Nowadays, gallbladder disease is a frequent problem in developed countries, representing a major health problem.[2]

Gallstone disease is a chronic recurrent hepatobiliary disease, the basis for which is the impaired metabolism of cholesterol, bilirubin and bile acids, which is characterized by the formation of gallstones in the hepatic bile duct, common bile duct, or gallbladder.[3] Gallstone disease and cardiovascular disease, common diseases worldwide, are strongly associated and have considerable economical impact.[4,5]

More than 20 million Americans suffer from gallstone disease, and 80,000 patients are hospitalized for gallstone disease every year.[6]

Intermediate prevalence rates occur in Asian populations (5-20%) and Black Americans (13.9% of women and 13.9% of men). The lowest frequencies are in Black Africans (<5%), the best studied being the Masi tribe and the Bantu, in whom the entity is virtually non-existent.[7,8] Prevalence of cholelithiasis in India is more in females ($n$ = 38) than men ($n$ = 15). The prevalence was more common in Northern Indians than Southern Indians followed by Maharashtra particularly form coastal region.[9]

There are many researches on etiology, clinical presentation, management specifically evaluating the modalities of

treatment but chemical analysis and bile culture though age old investigations were not given much importance in spite that they could give an insight into pathogenesis and presentation. Incidence in India partially attributed to widespread use of ultrasonography (USG) in the last two decades but changing socio-economic structure and changes in various other epidemiological factors including diet may also be responsible.

In the present study apart from studying the epidemiology, i.e., demographic factors, dietary habits, clinical presentation, diagnostic tools and complications after surgery in a rural population in central India.

## METHODS

This was a hospital based, "cohort" study. The patients reporting to outdoor or emergency of NPK Salve Institute of Medical Sciences, Nagpur, with symptomatic stones dyspepsia, acute or chronic cholecystitis, pancreatitis, clinically jaundiced, with USG abdomen confirming gall bladder calculus.

### *Inclusion exclusion criterion*

The patients of "cholelithiasis" with gallstone alone or with common bile duct (CBD). Stones diagnosed by ultrasound are included in the study, and patients who did not give consent to join the study or diagnostic dilemma for, e.g., acalculous cholecystitis or with primary CBD stones. i.e., no calculus in gall bladder were excluded from the study.

### *For stone analysis*

Considering the cost of analysis a representative sample of stones removed during surgical management was selected and chemically analyzed. The selection was done by random selection method (computer generated).

### *Study factors*

A detailed clinical history and physical examination was carried out and recorded in a standard proforma which included demographic factors (age and gender), dietary status (veg: pure vegetarian, mixed: vegetarian + poultry + meat + eggs), clinical presentation factors, (dyspepsia, acute upper abdomen pain chronic upper abdomen pain, jaundice, nausea/vomiting) and a standardized clinical examination was done which included general physical examination and systemic examination specially looking for tenderness in right hypochondrium, palpable lump in the right hypochondrium and hepatomegaly. The investigations included complete blood count, random blood sugar, liver function test, routine urine examination and USG abdomen. Magnetic resonance cholangiopancreatography (with dilated CBD >7 mm and raised alkaline phosphatase) and endoscopic retrograde cholangiography (in cases of suspected CBD calculus) was done prior to surgical intervention. Open cholecystectomy or laparoscopic cholecystectomy was done.

### *Ethical issue*

Ethical clearance was obtained from Institutional Ethical Committee of the Institute.

### *Statistical analysis*

The data was presented in tabular form using tables, pie and bar diagrams for descriptive statistics categorical variable were analyzed using Fisher's exact test and Chi-square test. Comparison of values of biochemical analysis was done using Kruskel–Wall is one-way ANOVA.

## RESULTS

### *Age and gender*

A total of 104 patients were enrolled prospectively, and the following results recorded.

The gallstones were most common in fourth and fifth decade, accounting for more than half of all cases (56%). The mean age of patients with gallstones was 43.56 years with a standard deviation of 13.18 in a range from 13 to 70 years (Figure 1).

In total of 104 patients, 36 were males and the rest 68 females. This shows that cholelithiasis is predominant in the female population with a male-female ratio of 1:1.88 (Table 1).

Comparing the mean age with reference to gender, the mean age of females was 44.29 years and 41.93 years in males ($p > 0.05$ not significant). The difference was statistically not significant, though it appeared to be more in older female population.

**Table 1: Gender distribution.**

| Sex | *N* (%) |
|---|---|
| Male | 36 (35) |
| Female | 68 (65) |
| Total | 104 (100) |

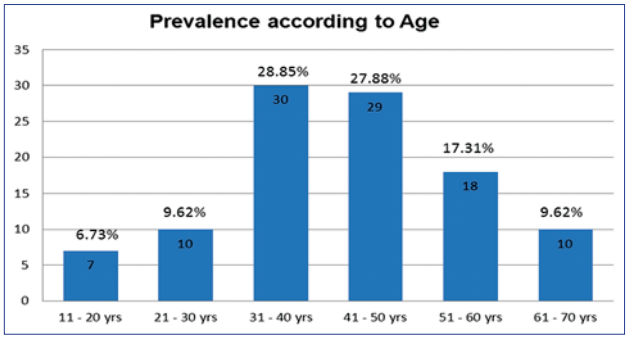


**Figure 1: Prevalence of cholelithiasis according to age.**

### *Type of stone*

Based on the external appearance criteria, 48 (46%) patients had mixed stones, 39(38%) pigment stones and 17 (16%) cholesterol stones out of 104 patients of gallstone (Figure 2).

### *Number with type of stone*

Correlating the number of stone and chemical type of stone, it was observed that out of 66 multiple stones 31 (46.97%) were mixed, 23 (34.85%) were pigment and 12 (18.18%) were cholesterol stones. Analysis of 38 single calculi showed that 18 (47.38%) were mixed, 14 (36.84%) cholesterol and rest 6 (15.78) were pigment calculi (Figure 3).

### *Diet*

60 patients consumed a mixed diet while the remaining 44 patients consumed pure vegetarian diet. Suggesting that cholelithiasis is more common in patients consuming a mixed diet, which essentially includes poultry, meat and eggs (Figure 4).

### *Diet and type of stone*

Mixed and pigment stones were the commonest stones observed in patients having pure vegetarian diet while mixed and cholesterol stones were commonly observed in patients having mixed diet. Cholesterol stones were seen approximately 3 times more common in patients consuming mixed diet than patients consuming vegetarian diet. However, statistical analysis using the Chi-square test showed that there was statistically insignificant difference in types of stones in patients with different diets (Table 2).

### *Clinical presentation*

All patients presented with pain in the upper abdomen, of which 74 patients (71.1%) presented with chronic upper abdominal pain while 30 patients (28.9%) had acute upper addominal pain. 72 patients (69.2%) presented with dyspepsia and flatulence, 67 patients (64.4%) with nausea or vomiting, only 7 patients (6.7%) had jaundice. 14 patients had fever, of these 7 patients were diagnosed as CBD calculus and rest were continuations of acute process of cholecystitis (Figure 5).

### *Abdominal ultrasound*

Abdominal ultrasound of 104 patients revealed solitary calculus in 38 patients (36.5%) and multiple calculi in 66 patients (63.5%). Abdominal ultrasound diagnosed CBD (they did not undergo to laparoscopic/open surgery). It was seen that Calculus in 5 patients while a total of 7 patients

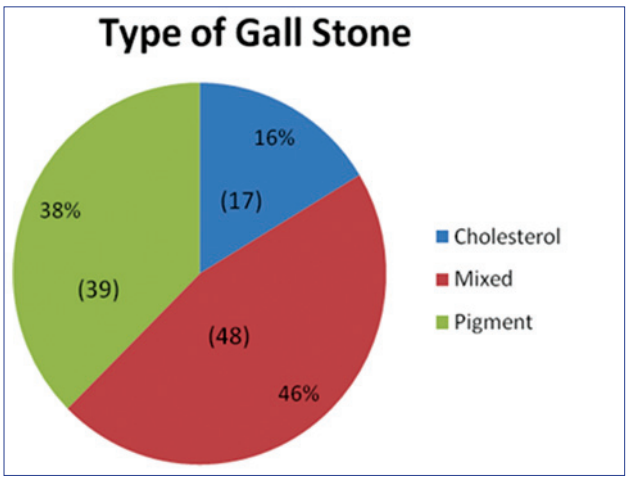


**Figure 2: Type of gallstone.**

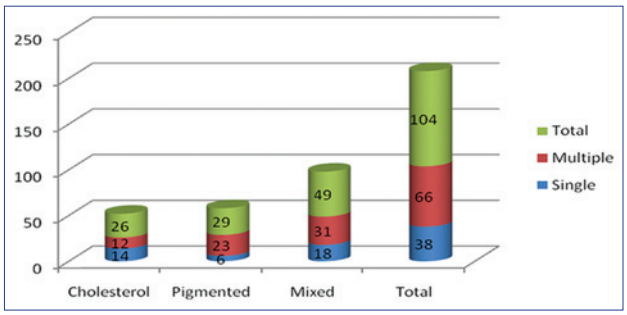


**Figure 3: Number and type of stone.**

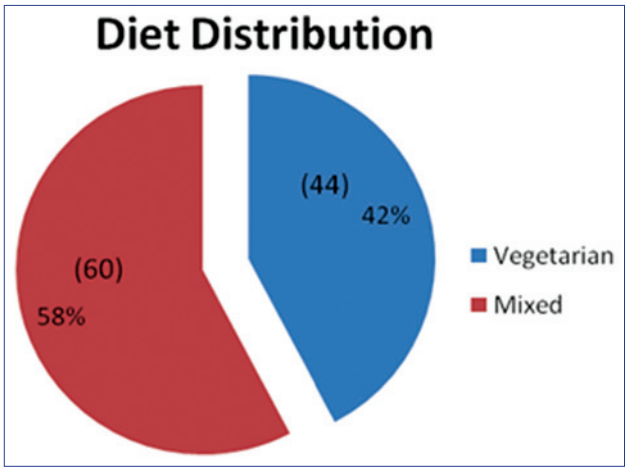


**Figure.4: Diet distribution.**

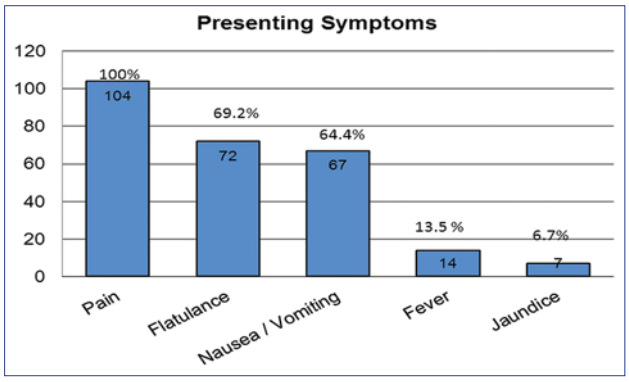


**Figure 5: Clinical presentation of patients.**

had CBD calculus on intraoperative correlation. Thus, the accuracy of abdominal ultrasound for diagnosis CBD calculus was 71.4% in this study (Table 3).

***Operative management***

All 104 patients underwent surgery. About 56 patients had laparoscopic cholecystectomy and 43 patients underwent open cholecystectomy. A total of 7 patients had CBD calculus, of which 5 patients underwent open cholecystectomy with CBD. exploration and 2 patients had ERCP guided stone removal followed by laparoscopic cholecystectomy (Figure 6).

***Post-operative complication***

Five out of 104 patients had surgical site infection which was managed by regular dressings and antibiotics. 5 patients had post-operative biliary leak of which one was classified as Type C biliary leak, as per Strasberg's classification and required re-exploration for biliary tract injury repair (Table 4).

When the post-operative complications between the two modalities of treatment were statistically compared, there was no statistical difference seen in wound infection or biliary tract leak or post-cholecystectomy syndrome.

## DISCUSSION

In the present study, 65% (68 out of 104) cases were females, while the rest 35% (36 out of 104) cases were males. Battacharya showed 71.4% were female; 28.6% were male.[10] Similar sex preponderance in the favor of females were observed by Tamhankar et al.[11,12] A study carried out by Sharma showed that 30% were male and 70% were female[13] and Thamil Selvi et al. showed 20.5% males and 79.5% females were patients of cholelithiasis.[14]

Our study showed that 48 (46%) patients had mixed stones, 39 (38%) pigment stones and 17(16%) cholesterol stones out of 104 patients of gallstone. While a study done in Haryana by Chandran et al. showed 26%, 38% and 36%, respectively.[15] In Haryana region study by Pundir et al. showed the prevalence respectively 14.2%, 68.6% and 17.2%.[16] Mixed stones are the most commonly encountered stones in North India.[17]

In our study we found that out of 66 multiple stones 31 (46.97%) were mixed, 23 (34.85%) were pigment and 12 (18.18%) were cholesterol stones, and in 38 single calculi 18 (47.3 8%) were mixed, 14 (36.84%) cholesterol and rest 6 (15.78) were pigment calculi. Vitetta et al. and Hsing et al. observed that gall bladder cancer patients were more likely to have multiple stones.[18,19] Domeyer et al. concluded that the solitary gallstones were the most important predictors for severe inflammation.[20] Khanna et al. could not document any association between the two in their respective studies.[21]

In this study, 58% (60 out of 104) patients consumed a mixed diet (predominantly non-vegetarian diet) and the rest 42% (44 out of 104) patients consumed a vegetarian. Non-vegetarians were found to be more commonly involved with cholelithiasis than vegetarians. The ratio of incidence of

**Table 2: Diet and type of stone.**

| Diet/type of stone | Cholesterol | Pigmented | Mixed | Total |
|---|---|---|---|---|
| Vegetarian | 6 | 19 | 21 | 46 |
| Mixed | 22 | 10 | 26 | 58 |
| Total | 28 | 29 | 47 | 104 |

**Table 3: Findings of abdominal USG.**

| USG finding | *N* (%) |
|---|---|
| Solitary calculus | 38 (36.5) |
| Multiple calculi | 66 (63.5) |
| CBD calculus | 7 (4.8) |

USG: Ultrasonography, CBD: Common bile duct

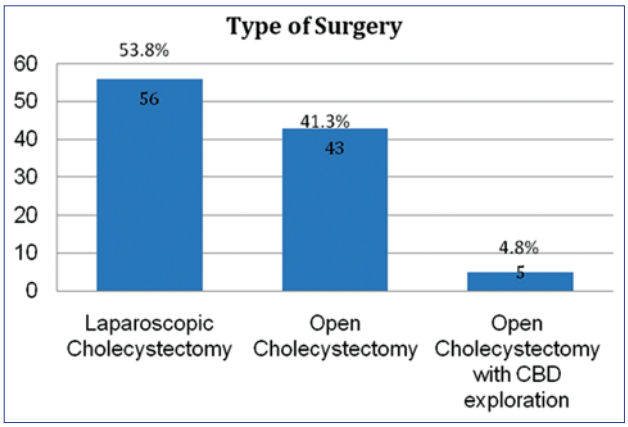


**Figure 6: Type of surgery done.**

**Table 4: Post-operative complications in open versus lap cholecystectomy.**

| Type of complication | Open cholecystectomy+ CBD exploration | Laproscopic cholecystectomy | *p* value by Fisher's exact test | Remark |
|---|---|---|---|---|
| Wound infection | 04/48 | 01/56 | 0.178 | Insignificant |
| Biliary leak | 03/48 | 02/56 | 0.659 | Insignificant |
| Post cholecystectomy syndrome | 01/48 | 00/56 | 0.461 | Insignificant |

CBD: Common bile duct

cholelithiasis in non-vegetarians and vegetarians was found to be 8:2. The cause could be due to the consumption of high protein and fat. The findings were similar with the findings in a study done by Maskey et al. in 1990 AD in Nepal where incidence of cholelithiasis was found more frequently among the people who consumed more fat and protein.[22]

Several studies that have evaluated the role of diet as a potential risk factor for gallstone formation, including energy intake, cholesterol, fatty acids, fiber, carbohydrates, vitamins and minerals, and alcohol intake. The association between cholesterol intake and gallstone disease has been variable in different studies. Recent discoveries of the role of orphan nuclear receptors in the regulation of fatty acid and hepatic cholesterol metabolism and excretion open new perspectives for a better understanding of the role of dietary constituents on cholesterol gallstone formation.[23]

We observed that 26 patients had acute onset of pain while the remaining patients had chronic pain similar result were found by Ganey et al. and Sharma.[12,13] Vomiting was spontaneous and occurred mostly during the attacks of pain this was also seen by Ganey et al.[12]

Ultrasound scanning revealed gall bladder calculus only in 99 patients and 5 patients had stones both in gallbladder and common bile duct. Solitary calculus was found in 38 patients on sonography but on intra-operative correlation three of these patients were found to have multiple calculi. Thus, the USG percentage of accuracy of solitary calculus is 92.1%.

In our study 56 patients had laparoscopic cholecystectomy and 43 patients underwent open cholecystectomy 7 patients had CBD calculus, of which 5 patients underwent open cholecystectomy with CBD exploration and 2 patients had ERCP. guided stone removal followed by laparoscopic cholecystectomy.

Laparoscopic cholecystectomy is a feasible and safe procedure even in most cases of acute cholecystitis albeit the conversion rate may be as high as 32%. The risk of bile duct injuries is higher and the operation time longer than in elective laparoscopic cholecystectomy. Factors associated with the need to convert may be male gender, duration of right upper abdominal pain and severity of the inflammatory process.[24]

Several studies demonstrated that the risk of conversion depends mainly on the degree of inflammation, pathology of gallbladder disease (e.g. thickness of gallbladder wall), age, male sex, and CBD diameter. Conversion rate in elective laparoscopic cholecystectomy may be 0% to 15%, but in cases of gangrenous cholecystitis or empyema it may be 50-83%. Ultrasound may help to predict the risk of conversion. However, the surgeon has to decide intra-operatively whether to convert to the open procedure within a short time.[25,26]

The conversion rate from laparoscopic to open cholecystectomy was about 9.6% of the total attempted laparoscopic cases (6 out of 62). The conversion rate in other studies was 7% in Schlumpf et al.[27] Our results matched with a study of 376 patients by Fajardo et al. for evaluation of cost effectiveness of laparoscopic and cholecystectomy in Colombian population.[28]

## CONCLUSION

From the present study, we conclude that the mean age of the patients was 43.56 years with a male-female ratio of 1:0.52. Mixed type of stone is more common than the cholesterol and pigmented and is more prevalent in a mixed diet than vegetarian. Multiple calculi were most frequently found in mixed type of stone while less in cholesterol while single calculi is more in mixed and less in pigmented type of stone. Pain flatulence and nausea/vomiting are the major clinical presentation of the gall stone. Wound infection and other complication were more predominant in open cholecystectomy group than the other procedure. Laparoscopic cholecystectomy was better than the other procedure of olecystectomy.

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